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Technical Report No. 9

Characterization of Polymer Interphases Using
Surface-Enhanced Raman Scattering

by

F. J. Boerio, J. T. Young, and W. H. Tsai

Presented

at

Materials Research Society
San Francisco, CA
April 16-20, 1990

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) Surface-enhanced Raman scattering (SERS) and reflection-absorption infrared spectroscopy (RAIR) were used to determine the molecular structure of interphases between polymers and metal substrates. An interesting example was provided by pyromellitic diimide (PMDI), a model compound for polyimides, and silver substrates. Normal Raman spectra of PMDI were characterized by strong bands near 1772, 1370, 760, and 655 cm^{-1} and medium intensity bands near 1630 and 1205 cm^{-1} were weak in SERS spectra obtained from films of PMDI spin-coated onto silver island films while those near 1370 and 1205 cm^{-1} and a new band near 685 cm^{-1} were strongest. Differences between the normal Raman and SERS spectra were related to orientation effects indicating that PMDI was adsorbed onto silver with a vertical conformation in which the rings were perpendicular to the surface and one imide group was in contact with the surface; SERS spectra were independent of PMDI film					
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thickness due to the short range of the SERS enhancement. However, RAIR spectra obtained from PMDI films spin-coated onto thick silver films did depend on PMDI film thickness. RAIR spectra obtained from thick PMDI films were similar to transmission infrared spectra of PMDI but spectra of thin films were different, again indicating that there was a preferred orientation of the molecules closest to the surface.



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